

THE MOVEMENTS OF THE WHITE-TAILED BLACK COCKATOO (*CALYPTORHYNCHUS* *BAUDINII*) IN SOUTH-WESTERN AUSTRALIA

By S. J. J. F. DAVIES, Division of Wildlife Research, C.S.I.R.O.,
Nedlands.

SUMMARY

A survey to clarify the movement pattern of the White-tailed Black Cockatoo, *Calyptorhynchus baudinii*, was carried out from 1959 to 1964. Records were kept by more than 72 observers scattered over the south-western corner of Western Australia.

The survey indicated that concentrations of cockatoos form on the coast between Esperance and Geraldton each summer. During the summer these concentrations move westwards along the south coast but no direction of movement could be established along the west coast. It appears that many of the birds involved in these summer concentrations spend the winter and spring inland, in the wheatbelt.

As well as this semi-migratory inland population, there is some evidence of a resident population in the heavy forest country of the extreme south-west corner.

INTRODUCTION

In 1959 the Division of Wildlife Research of C.S.I.R.O., in co-operation with the Agriculture Protection Board of the Department of Agriculture of Western Australia and the Forests Department of Western Australia, began a study of the White-tailed Black Cockatoo, *Calyptorhynchus baudinii*. During the past thirty years, this bird had become a serious pest of the plantations of maritime pine, *Pinus pinaster*, in south-western Australia, as well as occasionally causing extensive damage to apple orchards (Anon., 1943; Perry, 1948; Serventy and Whittell, 1962).

Both the White-tailed and the Red-tailed Black Cockatoo, *Calyptorhynchus banksii*, occur in south-western Australia, but although the red-tailed species may feed on a few newly-sown cereal crops in the wheatbelt, it is only the white-tailed species which has become a serious pest.

The range of the White-tailed Black Cockatoo is illustrated in Figure 1, each dot on the map representing a locality from which the birds were recorded during this study. In addition, Dr. D. L. Serventy has been kind enough to allow me to add localities which he has compiled by search through the literature, and the examination of museum specimens. The map is probably representative, except for the eastern sector, north of the south coast. Birds were observed at Norseman by Whitlock (1937) and it seems probable that they do occur, at least in good seasons, in the area south and west of Norseman, which is still sparsely populated.

The Red-tailed Black Cockatoo appears to occur locally throughout coastal Western Australia, from the Kimberleys to Esperance, but its detailed distribution is not known. The location of only 19 nests of the White-tailed Black Cockatoo could be found from the records of observers in this survey, a search through the literature and an examination of the collections of the Western Australian Museum. Apart from the extreme north and east the birds appear to nest throughout their range. Since they nest in isolated pairs in

hollows high in tall eucalypt trees the small number reported is not surprising.

Previous observers have noticed movements of White-tailed Black Coekatoos around the south-western corner of Western Australia. Leake (in North, 1911) remarked that the birds leave the Kellerberrin district in November and December "for the coast" and return in April and May. Orton and Sandland (1913) observed that

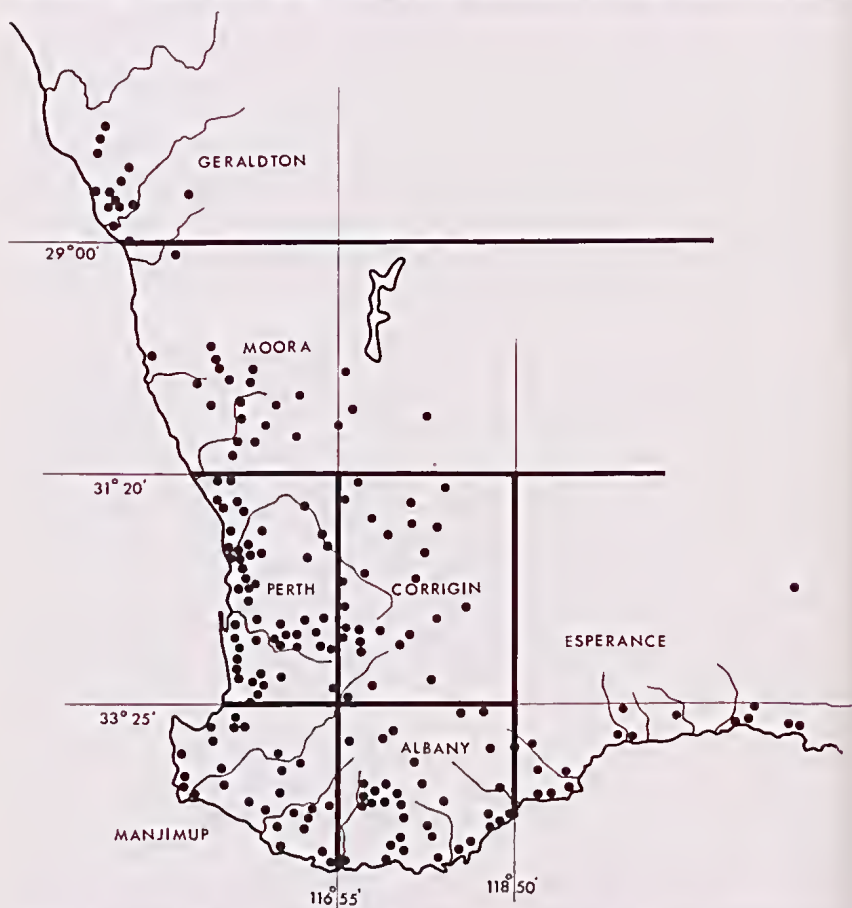


Fig. 1.—Map of the south-west corner of Western Australia showing the range of the White-tailed Black Coekatoo. Each dot on the map shows a locality at which the birds have been observed. The range has been divided into seven named regions to assist in the examination of the birds' movements.

the birds left the Moora district in November and December for the coast and returned when the first rains fell in winter. Southward movements over Perth have been reported "after the breeding season" by Alexander (1921), in July by Serventy (in Cohn, 1926), from June to September by Sedgwick (1940) and from August to November by Serventy (1948). Northward movements over Perth were noted in March and April by Sedgwick (1938; 1940) and from March

to June by Serventy (1948). Perry (1948) observed regular movements into the pine plantations around Perth in February and March and out again in August and September. Orchardists in the Bridgetown and Mt. Barker areas reported that whereas the birds invaded their orchards in some years in large numbers, in others they did not appear at all, or only in insignificant numbers. There was therefore the suggestion that at least some parts of the White-tailed Black Cockatoo population performed seasonal movements and the first task of the study was to define this pattern of movement over as wide an area of the bird's range as possible. This paper reports the preliminary results of the study.

Since a satisfactory band has not yet been devised for this large cockatoo, the study has relied upon the co-operation of a large team of amateur observers scattered over south-western Australia. Officers of the Western Australian Department of Agriculture and the Western Australian Forests Department as well as numerous private individuals have collected the observations during the years 1959 to 1964, and the author is extremely grateful to them for their extensive efforts.

METHODS

It is convenient to divide the records of cockatoos into two groups: those kept by permanent residents in a particular area and those kept by itinerant observers or observers who spent only a short time in a particular area. Whereas the resident recorders were likely to see (or hear) most of the White-tailed Black Cockatoos that visited the immediate area of their homes, the itinerant observers, although they might spend some months in one place, might not, on account of their occupation, see all the flocks of cockatoos that visited the area. Indeed, many of the itinerant observers travelled hundreds of miles a week, and recorded cockatoos whenever and wherever they found them.

All observers were provided with standard forms, on which were columns headed: species (Red or White-tailed), date, time, direction of flight, and number of birds. A separate form was supposed to be used for each locality but most of the itinerant recorders indicated the locality of their observation next to the species name, and filled each sheet before returning it.

All records in which the species of cockatoo observed was not specifically stated were discarded. All other records were then classified by locality into one of the seven regions shown in Figure 1.

The monthly total of White-tailed Black Cockatoos seen by the resident observers and presented in Table 1 is the uncorrected total of their counts within the month. In cases where the number of birds was given as being between two limits (say 20 to 30, or 50 to 100), the lower figure was used in the computation.

The records made by the itinerant observers could not be summed up in the same way. In the first place it seemed that there might be considerable variation between individual observers in their estimate of the number of cockatoos in the same flock, particularly when large numbers of birds were seen at once. For this reason a method of approximating the figures was adopted. Flocks described

as "few," "small" or any number between 1 and 10 were given an approximate value of 5. Flocks described as "some" or any number from 11 to 50 were given a value of 30 and flocks described as "many," "very many," or any number 51 and above were given an approximate value of 100. These approximations tended to increase the low counts and diminish the large estimates, so that it was thought that any sharp increase which showed up despite this "smoothing" was probably a real one. The smoothed observations were then summed to give monthly totals for each region.

Because the total depended upon the number of localities in each region at which counts were made each month, the monthly totals were then adjusted to allow for this source of error. The only method available for assessing the length of time an observer spent at a locality was to count the months in which records were made from that locality. For each month the number of localities at which obser-

TABLE 1.—MONTHLY TOTAL COUNTS OF WHITE-TAILED BLACK COCKATOOS AT SPECIFIED LOCALITIES

Year Month	1959					1960							
	D	J	F	M	A	M	J	J	A	S	O	N	D
Locality													
Karridale					64	14	80	105	58	20	22	19	3
Pemberton		96	254	187	136	66	5		34	13	13	15	1
Manjimup		5		366	15	40	27			54	50		
Riverside							53	71	0	11	18	36	3
Cordinup	38	464	357	117	106	50	0	0	0	3	0	0	10
Warriup		64	114	74	73	28	0	0	0	2	0	0	
Beckon			128	75	16	0	0	0	0	0	11	0	
Mt. Barker*							55	20	5	185	45		
Mundaring		555	988	1505	300			228	17	56	18	20	3
*Corrected total.													
							1961						
Karridale		8	10	6	0	114	0	9	30	80	10	116	
Pemberton		24	2	72	60								
Manjimup				59	42	20	35				23		
Bridgetown		4	0	66	77	246	139						
Riverside		33	167	324	124	43	0	0	33	0	17		
Crystal Springs		101	126	319	81	7	5	0	0	16	51	15	2
Albany			228	329	196	14	95	46	6				
Cordinup		127	349	96	0	0	0	0	0	15	0	59	200
Warriup		558	9	55	62	11							
Beckon		24	93										
Kojonup		53								450	100	36	2
Mundaring			350	200	304	153	161	273	48	90	349	56	4
							1962						
Karridale				132									
Manjimup		20	31	74	26	5	13		5	2	8	37	
Cordinup		2118	22	28									
Kojonup		0	0	0	36	74	113	0	0	47	0	0	5
Mundaring		1365	1843	1035	294	34	52		22	63	51	114	13
							1963						
Manjimup				53	250	115	64						
Kojonup		88	133	71									
Mundaring		63	1131	680	48	13	29						

variations were made was determined. The highest of these numbers was then used as a standard and all the monthly totals of cockatoo numbers corrected as if the number of localities at which records had been made was as high as the highest. The correction may be summarised by the formula

$$T^1 = \frac{TN}{n}$$

where T^1 is the corrected monthly total of cockatoos

T is the observed monthly total of cockatoos

N is the greatest number of localities in that region at which observations were made in any month

n is the number of localities at which observations were made during the month to which T refers.

The monthly totals, corrected in these two ways, are given in Table II.

TABLE II.—CORRECTED MONTHLY TOTAL NUMBER OF WHITE-TAILED BLACK COCKATOO COUNTS FROM EACH REGION

Region	1959					1960							
	D	J	F	M	A	M	J	J	A	S	O	N	D
Manjimup	40	415	573	313	174	186	252	106	186	174	470	320	200
Albany								75	37	100	119	94	165
Esperance							400		140	187	100	600	400
Perth	900	1328	643	390	405	780	297	535	270	612	405	414	1840
Corrigin		300	300	475	1250	625	1125						
Moora							275	160	215	85	75	150	320
Geraldton								90	300	300			15
1961													
Manjimup		200	386	346	130								
Albany		25	400	117	206	650	150		300	25	25		
Esperance		400	347	330	313	400	20						
Perth		288	144	570	585	396	370	270			270		
Corrigin				450								300	
Moora			315	85	50								
Geraldton		780	300		230	400							
1962													
Manjimup					240	240				500	280	66	600
Albany						25		25		170	975	475	
Esperance			400										
Perth			877	1188	900	285	840	270	207	382		540	300
Corrigin	237		210	25	150	150	412	400		25			
Moora			1385	1150	500	550	250		350	340	160	50	
Geraldton			300	90			300			300	90		90
1963													
Manjimup		306	414	260	280	800							
Albany		200											
Perth			270	1335	1620	1035	195		63				
Moora		500			150	150		150	150	162	191	137	
Geraldton			90										

RESULTS

Between December 1959 and June 1961 an excellent coverage was maintained by the resident observers and the movements of cockatoos in the southern part of their range could be traced clearly.

During 1960 there were concentrations of birds at Cordinup and Beckon in January, Pemberton in February and Manjimup and Mun-

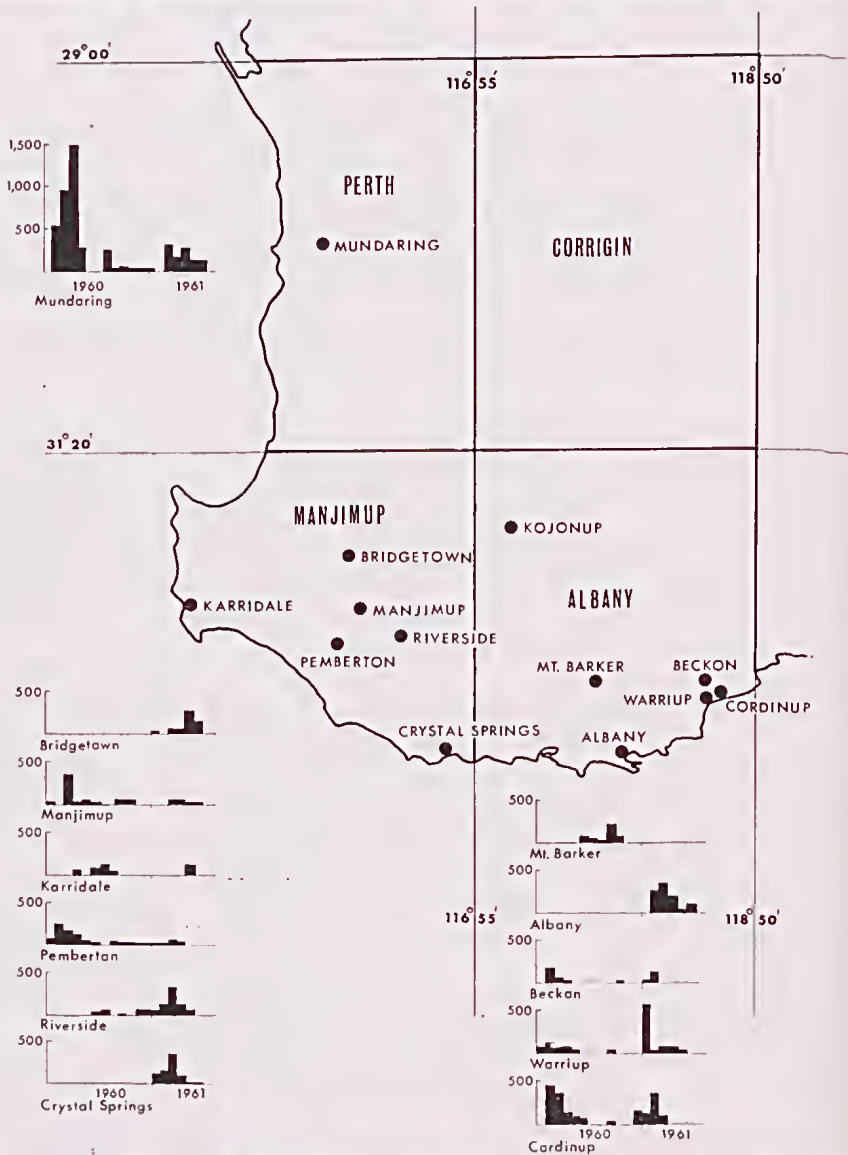


Fig. 2.—Map of the lower south-west of Western Australia, showing the location of the resident observers. The names of the regions are in large type. The histograms show the total counts of White-tailed Black Cockatocs for each month from December 1959 to June 1961.

Each histogram refers to the locality indicated.

daring in Mareh. In September there was a concentration at Mount Barker.

In 1961 there were concentrations at Warriup in January, Cordinup in February, Albany, Crystal Springs and Riverside in Mareh and Bridgetown and Karridale in May. The results for the period December 1959 to June 1963 are illustrated in relation to the geographical location of the recording site in Figure 2.

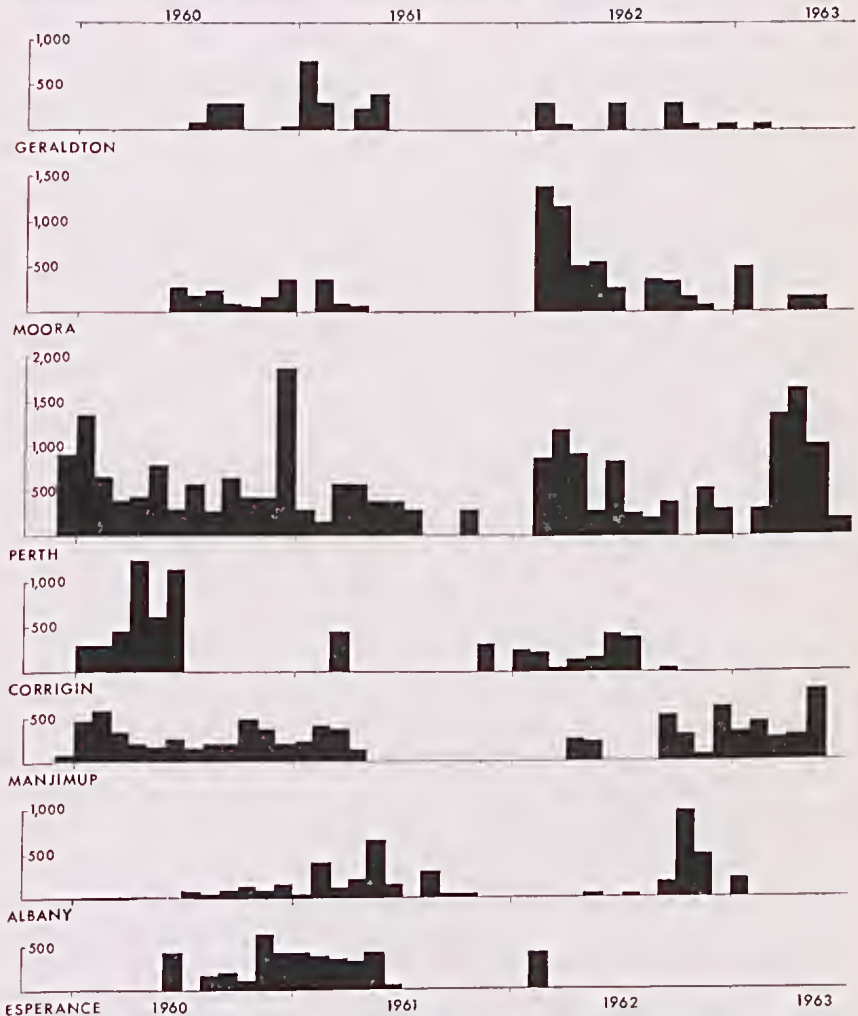


Fig. 3.—Histogram of the corrected monthly total counts of White-tailed Black Cockatoos from each region, December 1959-June 1963.

After the middle of 1961 rather few returns were received from the resident observers, but there were concentrations at Cordinup in early summer 1961-62, Manjimup in April 1963, Mundaring during February in both 1962 and 1963, and Kojonup in September 1961.

The data from the itinerant observers was, by its nature, more variable than that of the resident observers, but there is evidence of

concentrations of cockatoos in some seasons. The figures are presented in Table II and illustrated in Figure 3.

Summer concentrations were observed in the Geraldton region in January 1961, the Moora region in February 1962 and the Perth region in January and December 1960, March 1962 and April 1963. At other times of the year there were concentrations in the Corrigin region in April and June 1960, Albany in May 1961 (from the inland areas of Needilup and Ongerup) and October 1962 (from the inland area of Cranbrook).

The concentrations of cockatoos seem to follow a fairly regular pattern about the south-west portion of the State, and although there are gaps, a preliminary statement of this pattern can be made. The records of the resident observers in 1960 and 1961 (Figure 2) show that concentrations of birds formed on the south coast east of Albany in early summer. Thus birds were only seen at Beckon, Warriup and Cordinup at this time of year. Subsequently concentrations formed farther west, at Pemberton in February 1960, Albany, Crystal Springs and Riverside in March 1961, Manjimup in March 1960 and Bridgetown in May 1961. It is possible that these were mere local concentrations, but since the birds disappear from the eastern localities before concentrations form farther west, it is probable that a real shift in the population occurred, and that during the summer birds which reached the coast east of Albany, gradually moved westward along it, into the deep south-west in late summer and autumn. The observations made in subsequent years were consistent with this pattern, although the coverage was by no means as good.

The records from Mundaring, together with those of the itinerant observers from the Perth, Moora and Geraldton regions showed that summer concentrations also formed on the west coast. However, there did not seem to be as clear a pattern of movement along the coast as is indicated on the south coast. Certainly the birds were more numerous at Mundaring and in the Perth region as a whole in the summer than at other times of the year, and this probably represented a post-breeding movement from inland to the coast, since small numbers were observed in the Corrigin region, east of Perth, during the summers 1959-60 and 1961-62, when records are available. There was also evidence of a summer concentration in both the Moora region (1962) and the Geraldton region (1961). The concentration around Geraldton occurred after one in the Perth region, suggesting a movement north, but the concentration at Moora occurred at the same time as a concentration in Perth, and suggests that these peaks represented a shift of the inland population to the coast after the breeding season. Orton and Sandland (1913) have already noted movements of this type in the Moora area, as did Leake (in North, 1911) at Kellerberrin. Published accounts (cited in the Introduction) do not refer to movements over the Perth area between November and March when such conspicuous movements appear to be taking place along the south coast.

The nature of the movements along the west coast can only be elucidated by further and more detailed observations, but it is at least

clear that coastal concentrations of the White-tailed Black Cockatoo can occur in the summer along the coast at least as far north as the Geraldton region.

In winter the evidence suggested that there were more cockatoos inland in the wheatbelt than on the coast. The peak populations recorded at inland localities occurred between April and October (Mount Barker, September 1960; Kojonup, September 1961; Corrigin region April and June 1960; Albany region May 1961 and October 1962). During the summer few cockatoos were observed in inland districts, suggesting that the summer coastal concentrations may involve a real shift of the bulk of the inland population to the coast and not be simply local concentrations.

DISCUSSION

The results of this observational survey of the movements of the White-tailed Black Cockatoo suggest that the birds move to the south and west coasts in the summer, but that the time of arrival at any particular locality may differ from one year to the next. Those that reach the south coast east of Albany move westwards during the summer, arriving at the extreme south-west from Mareh to May. Presumably they then return to the inner wheatbelt, where large numbers are recorded from April until October. No clear movement has been observed along the west coast. Although there are breeding records from most of the range of the bird, the results of this survey indicate that large numbers of cockatoos are observed in the inner wheatbelt during the breeding season, late winter and spring. There is at present no indication by what route the birds return to the inland.

The ultimate factors determining these movements may be food supply and breeding requirements, but this survey has not provided any significant information on this point. It has merely defined more clearly the bird's movement patterns, and shown that its timing is subject to variation from year to year.

Carnaby (1948) has presented figures which suggest that the inland form of the White-tailed Black Cockatoo differs subspecifically from that of the heavy jarrah and karri forests of the extreme south-west. Serventy (pers. comm.) has been kind enough to show me figures he has collected which confirm that the bill of the south-western birds is longer and narrower than those of the inland birds. Possibly it is only the inland birds which are involved in the movements described in this paper and it is noteworthy that the counts from Karridale (Table I and Figure 2) and the Manjimup region (Table II and Figure 3) show considerably less seasonal variation than those of other localities and regions. It is quite possible, therefore, that the extreme south-western corner of the State carries a permanent, resident population of cockatoos, genetically isolated from the semi-migratory inland population, which appears to penetrate this area only occasionally, e.g., 1960; 1963. Banding the birds of both populations clearly must be the next stage in an elucidation of the movement patterns.

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REFERENCES

- ALEXANDER, W. B. 1921. The birds of the Swan River district, Western Australia. *Emu*, 20: 149-168.
- ANON., 1943. Branch report for Western Australia. *Emu*, 42: 162.
- CARNABY, I. C. 1948. Variations in the White-tailed Black Cockatoo. *W.A. Nat.*, 1: 136-138.
- COHN, E. 1926. Records of birds' movements, *Emu*, 25: 282-286.
- NORTH, A. J. 1911. Nests and eggs of birds found breeding in Australia and Tasmania. *Australian Museum, Special Catalogue 1*, vol. 3: 73-74.
- ORTON, C. L. E., and P. T. SANDLAND. 1913. Birds of Moora (W.A.) and district. *Emu*, 13: 75-80.
- PERRY, D. H. 1948. Black Cockatoos and pine plantations. *W.A. Nat.*, 1: 133-5.
- SEDGWICK, E., and A. G. CAMPBELL. 1938. Charting bird movements. *Emu*, 38: 321-322.
- SEDGWICK, E. 1940. Birds of the Roekingham district, Part II. *Emu*, 40: 237-245.
- SERVENTY, D. L. 1948. The birds of the Swan River district, Western Australia. *Emu*, 47: 241-286.
- SERVENTY, D. L., and H. M. WHITTELL. 1962. *Birds of Western Australia*. 3rd edition, Perth.
- WHITLOCK, L. 1937. Birds of the Norseman district, Western Australia. *Emu*, 37: 106-114.